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In the claims:

1. (currently amended) A materials joining process comprising:
cold working a surface of a substrate; and
bonding a consumable insert to the substrate surface with a transient liquid phase bonding process at a bond temperature;
wherein the substrate surface is cold worked to a degree sufficient to cause grains nucleating in a molten region of the consumable insert during the transient liquid phase bonding process to grow into the substrate, and to a degree less than that which would cause recrystallization of the substrate at or below the bond temperature, to produce bond line grains having a size exceeding a thickness of the molten region.
2. (original) The process of claim 1, further comprising:
cold working respective surfaces of two substrates; and
bonding the two surfaces together with the consumable insert during the transient liquid phase bonding process.
3. (original) The process of claim 2, further comprising cold working each of the two respective surfaces to a different degree.
4. (original) The process of claim 1, further comprising imparting an uneven pattern of cold working stress into the surface.
5. (original) The process of claim 1, further comprising bonding the cold worked surface to an opposed surface that is not cold worked with the transient liquid phase bonding process.
6. (original) The process of claim 1, further comprising shot peening the surface to within the range of 8-16 on the Almen A scale.

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7. (original) The process of claim 1, wherein the substrate surface is cold worked to a degree sufficient to cause grains to grow into the substrate to a size at least twice the thickness of the molten region.

8. (original) The process of claim 1, wherein the substrate surface is cold worked to a degree sufficient to cause grains to grow into the substrate to a size at least three times the thickness of the molten region.

9. (original) The process of claim 1, wherein the substrate surface is cold worked to a degree sufficient to cause grains to grow into the substrate to a size at least four times the thickness of the molten region.

10. (currently amended) A materials joining process comprising:
applying a joining process to join ~~two substrates~~ a substrate to another member
to form a joint ~~having grains~~;
cold working the ~~substrates~~ substrate proximate the joint after the joint is formed; and
heat treating the ~~substrates~~ substrate and the joint together to recrystallize nucleate and grow ~~the joint grains in the joint~~;
wherein the substrate is cold worked to a degree sufficient to cause the joint grains to recrystallize and grow into the substrate during the heat treating step.

11. (original) The process of claim 10, wherein the joining process comprises a transient liquid phase bonding process, and wherein the joint grains grow into the substrate to a size greater than a thickness of a molten region existing during the transient liquid phase bonding process.

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12. (currently amended) A materials joining process comprising:
cold working a substrate surface;
applying a second material against the cold worked substrate surface;
heating the second material and cold worked substrate surface together to a bonding temperature; and

wherein the substrate surface is cold worked to a degree sufficient to allow grains nucleating in the second material to grow into the substrate surface during the heating step but to a degree less than that which would cause recrystallization of the substrate at or below the bonding temperature.

13. (original) The process of claim 12, wherein the substrate material comprises a first substrate material and the second material comprises a second substrate having a surface.

14. (original) The process of claim 13, further comprising cold working the second substrate surface prior to the steps of applying and heating to allow the grains nucleating in the second material to grow into the second substrate during the step of heating.

15. (original) The process of claim 12, wherein the second material comprises a consumable insert that becomes molten during the step of heating.

16. (original) The process of claim 15, further comprising applying the consumable insert between the cold worked substrate surface and a surface of a second substrate during the step of heating to form a bond between the cold worked substrate and the second substrate.

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17. (original) The process of claim 16, further comprising cold working the second substrate surface prior to the step of heating so that the grains nucleating in the consumable insert material grow into the second substrate during the step of heating.

18. (original) The process of claim 13, further comprising cold working the second substrate surface prior to the steps of applying and heating to lower a recrystallization temperature of the second substrate surface to below the bonding temperature so that during a heat up to the bonding temperature the second substrate surface will nucleate recrystallized grains and the recrystallized grains will grow into the first substrate during the step of heating.

Claims 19-24 (cancelled).

25. (new) The process of claim 10, wherein the joint comprises a weld region, and wherein grains nucleating in the weld region grow into the substrate after the joint has been formed.

26. (new) The process of claim 10, wherein the substrate is cold worked to a degree sufficient to cause the joint grains to grow through a full thickness of the substrate.